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NAVIGATING THE FUTURE OF ELECTRIC VEHICLES: MARKET DYNAMICS, GEOPOLITICAL IMPACTS, AND TECHNOLOGICAL INNOVATIONS

НАВІГАЦІЯ МАЙБУТНЬОГО ЕЛЕКТРИЧНИХ АВТОМОБІЛІВ: ДИНАМІКА РИНКУ, ГЕОПОЛІТИЧНІ ВПЛИВИ ТА ТЕХНОЛОГІЧНІ ІННОВАЦІЇ

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Introduction. The electric car market has seen remarkable growth in recent years, driven by technological advancements, government policies, and increasing environmental awareness. In 2023, electric vehicle (EV) sales reached an all-time high, making up over one-fifth of the global automobile market [8]. As nations aim for carbon neutrality, the demand for EVs continues to rise, but challenges such as resource constraints, infrastructure development, and pricing remain critical considerations.

Understanding the dynamics of the electric vehicle market is essential for multiple reasons. The automotive industry is a key driver of global economic growth, and the transition from internal combustion engines (ICEs) to EVs represents a significant industrial shift. Additionally, the environmental implications of EV adoption are profound, with the potential to reduce greenhouse gas emissions and dependency on fossil fuels. The geopolitical and economic consequences of the evolving EV market, particularly in terms of supply chains and trade balances, make it a crucial topic for policymakers and business leaders.

Market Overview. The global EV market was valued at $538.8 billion in 2022 and is expected to reach $906.7 billion by 2028 (see Figure 1), growing at a compound annual growth rate (CAGR) of 10.07% [3]. The market consists primarily of Battery Electric Vehicles (BEVs) and Plug-in Hybrid Electric Vehicles (PHEVs). Among key players, Tesla leads in BEV sales, while BYD dominates the PHEV segment [2]. The year 2025 is

expected to be a crucial turning point, with EVs likely surpassing internal combustion engine (ICE) vehicles in several major markets due to stricter emissions regulations and technological advancements.

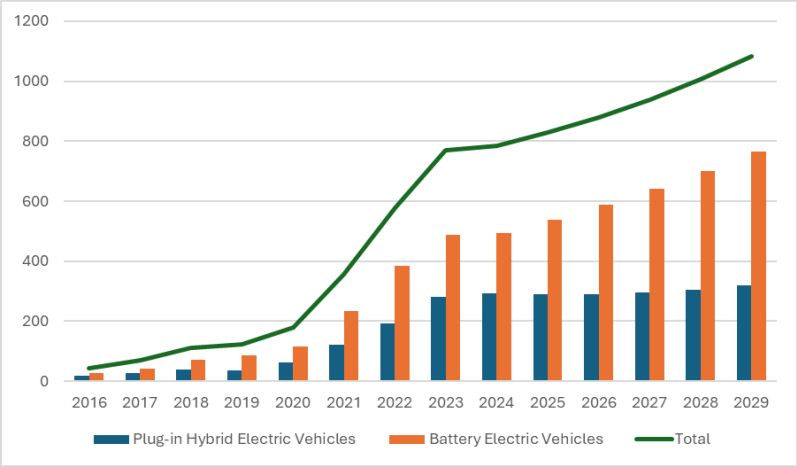

Figure 1. Electric Vehicles Revenue projection 2016-2029 in billion USD
Source: [3]

Global Supply and Demand. China, the United States, and Germany lead in EV production, with China alone accounting for over 8 million EV sales in 2023 [8]. The demand remains stable, supported by government incentives and infrastructure development. However, supply chain disruptions, geopolitical tensions, and raw material shortages pose ongoing challenges [5]. The rise of Chinese automaker BYD (Build Your Dreams) is particularly noteworthy, as it continues to expand its global market presence with cost-effective and technologically advanced models. BYD's aggressive expansion strategy, including partnerships and localized manufacturing, is expected to challenge Tesla's dominance by 2025.

Germany was the top exporter of EVs in 2022, with exports worth over $25 billion, followed by China and Belgium [7]. However, the EU is projected to become a net importer as Chinese automakers increase their market presence. In the EU, EV sales are driven by strict CO2 regulations and government incentives but concerns about market saturation and sustainability remain [7]. By 2025, European automakers may need to implement aggressive strategies to counter the influx of affordable Chinese

EVs, such as forming strategic alliances or investing in next-generation battery technology.

Table 2

20 largest EV manufacturers

Manufacturer	BEV	FCEV	PHEV	Total
BYD	913,866	0	944,497	1,858,363
Tesla Inc.	1,314,319	0	0	1,314,319
VW Group	578,231	0	260,905	839,136
GM	568,647	0	15,955	584,602
Stellantis	301,577	0	227,580	529,157
Hyundai Motor	372,092	11,199	125,724	509,015
BMW Group	218,882	108	214,282	433,272
Geely Auto Group	265,811	0	85,545	351,356
Mercedes-Benz Group	162,909	0	174,074	336,983
R-N-M Alliance	259,164	0	76,998	336,162
GAC	287,599	0	378	287,977
SAIC	203,205	168	53,136	256,509
Geely-Volvo Car Group	118,029	0	135,237	253,266
Chery Automobile	235,533	0	17,608	253,141
Changan Automobile Group	201,589	0	43,966	245,555
Other	231,453	0	7,610	239,063
Dongfeng Motor	222,841	3	15,301	238,145

Source: [2]

Influences on the Market. Elon Musk, the CEO of Tesla, has played a pivotal role in shaping the EV industry. His advocacy for sustainable energy, coupled with Tesla's innovation in battery technology and autonomous driving, has accelerated the shift toward electric mobility. However, Musk's unpredictable leadership style and political views have sparked controversies that could impact Tesla's brand perception and investor confidence [4]. Tesla and European automakers face increased competition from BYD and other Chinese companies, mainly because of the lower price, wider accessibility and high-end technology [6]. The companies are expected to focus on software innovations, artificial intelligence-driven driving systems, and expansion into energy storage solutions to maintain the competitive edge in 2025 and beyond.

Price Trends and Future Outlook. EV prices vary globally, with China offering the most affordable models at an average of $10,000 compared to over $30,000 in the US and Europe [8]. Price elasticity remains high due to government subsidies, competition, and battery cost reductions. The market is expected to continue expanding, but challenges such as charging infrastructure and raw material constraints will require innovative solutions [1]. Additionally, as Tesla and BYD push towards making EVs more accessible, more mid-range models with improved range and charging speeds are expected to dominate the market in 2025.

Conclusion. While the electric car market is poised for significant growth, its future depends on overcoming challenges related to supply chain stability, infrastructure, and affordability. The transition to sustainable mobility requires continuous innovation, regulatory support, and advancements in battery technology. Policymakers and industry leaders must collaborate to ensure a sustainable and equitable future for electric transportation. With BYD emerging as a strong competitor and Tesla navigating both technological and political challenges, the upcoming period is set to be a transformative year for the global EV industry.

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THE IMPACT OF DIGITALIZATION ON THE TRANSFORMATION OF INTERNATIONAL ECONOMIC RELATIONS

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The modern world is rapidly changing under the influence of digital technologies, which are becoming a fundamental component of international economic relations. Digitalization not only opens up new opportunities for cooperation between countries, but also significantly transforms the structure of the global economy, changing traditional approaches to trade, investment, finance and interstate cooperation.

Digitalization is driving the growth of e-commerce, which allows companies to enter global markets without the need for a physical presence. Platforms such as Amazon, Alibaba, and Shopify have become key players in this process. Thanks to digital solutions, small and medium-sized enterprises have gained access to international markets that were previously unattainable due to limited resources. Of course, electronic platforms simplify the process of finding partners, concluding deals, and organizing supplies. “The number of intermediaries between producers and buyers has sharply decreased. This property of e-commerce (and electronic platforms) radically changes the peculiarities of interaction in the electronic sphere” [1, p. 32]. In addition, digitalization allows reducing transaction costs by automating document management processes using blockchain technologies.